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Identification of the income level needed for agricultural enterprises to achieve economic sustainability

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ABSTRACT

This study aims to identify the income level required for agricultural enterprises to achieve economic sustainability. The theory behind the equation used to calculate a sustainable income is explained. The ecological, technical, social and economic components of sustainability in agricultural enterprises have been identified and discussed and the importance of economic sustainability in terms of achieving total sustainability has been emphasised. Economic sustainability was divided into three components incorporating the income needed to meet the cost of living and to address depreciation and interest costs for the enterprise. Those enterprises that achieved this income level were determined to be economically sustainable. For this purpose, data was collected by using a face-to-face survey method with 181 agricultural enterprises operating in Konya and analysed in line with the purpose of the study. According to the results of our analysis, it was observed that more than 150 enterprises were not sustainable.

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1. Introduction

Agriculture is dependent on biological, natural and human factors. It has a higher risk ratio and is less attractive to investment compared to other sectors. While the dependence of agricultural production activity on ecological factors leads to high risk and uncertainty in terms of production and elastic agricultural product supply and demand, it creates an unstable agricultural market, a slow conversion rate for capital investment and limited storage and marketing facilities for the products. The socio-economic, demographic and biological factors leading to these negative effects constitute the most important disadvantages faced by agriculture (Topçu, 2008).

The agricultural sector, especially in developing countries, has an important role to play in terms of the capital required for other sectors, through skilled labour, the supply of raw materials for industry, exports and its contribution to national income and the provision of employment opportunities. In addition, meeting the nutritional requirements of human populations, preserving scarce natural resources and addressing the ecological balance that

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has deteriorated due to environmental pollution is further proof of the importance of this sector (Albayrak, Gülçubuk, & Güneş, 2004). In view of the importance of the agricultural sector, its sustainability is vital, in spite of the challenges it faces. The sustainability of the agricultural sector is only possible if the farm enterprises within it are sustainable.

Overall agricultural sustainability (sustainable agriculture) is defined as an integrated system of plant–animal production applications to meet human food and fibre needs in a satisfactory way over a long period of time, to increase natural resources based on environmental quality and the agricultural economy and to maintain the non-renewable resources and the economic viability of the farm enterprise (CGIAR, 1989). Agricultural sustainability is resided in dimensions of social, economics and environment. Therefore, sustainability of the agricultural production system succeeds provided that it is economically implementable, socially admissible and sensitive for environment (Shiri, Motamedinia, Hashemi, & Asadi, 2012; Thanh, Sukprasert, & Yapwattanaphun, 2015).

Sustainability is discussed in the relevant literature (micro and macro) in a very broad way in terms of economics (European Commission, 2001; Goldman, 1995; Gürlük, 2010; Pezikoğlu, 2006; Rigby, Howlett, & Woodhouse, 2000). Because of the different nature of the sectors constituting the economy, it is not possible to develop a single approach to the concept of sustainability and size. There are different approaches for different sectors and purposes (Gençler, 2009; Lutz, 1998). Gomez, Kelly, and Syers (1996) defined sustainability as supplying the needs of the enterprise while protecting natural resources.

The issue that is given the greatest emphasis in sustainability work is environmental sustainability (INEGI, 2000; Jongbloed & Lenis, 1992), but some studies have also covered social and economic sustainability (Rigby et al., 2000). Sustainability research for agribusinesses covers social, economic and a number of other different variables (Dillon, Hennessy, & Hynes,2010; Hill, 2001; Mulder & Brent, 2006; Perales, Fregoso, & Martinez, 2000; Tatlıdil, Boz, & Tatlidil, 2009; Thanh et al., 2015). In this type of work, complex calculation methods are used with the use of first and second sourced intensive data. Although the results of this type of work are very valuable and enlightening, it is not possible to develop policies from them or to generalise the results, since they require more varied and complex calculation methods. Also, the variables have an environmental and social character that cannot be controlled in the short-term by the public or the enterprise owners used in these studies (Ceyhan, 2010; Gündüz, Ceyhan, Erol, & Ozkaraman, 2011).

In economics, sustainability, especially in terms of neo-classical economic theory, is defined as welfare maximisation (Haris, 2000). Thanh et al. (2015) focused on the necessity of improving awareness of economic benefits of sustainable agriculture in order to increase farmers' perception towards sustainable agriculture. Achieving the highest welfare level in the agricultural sector is used as a synonym for sustainability, because the sustainability of the enterprise is directly proportional to its economic structure. It is easier to ensure the environmental, social and technical sustainability of an enterprise with a high level of economic development. The studies conducted support this.

The European Commission (2001) accepted the renewal ratio of working capital as a sustainability criterion. In his study, Ceyhan (2010) calculated a sustainability index by using economic, ecological, social and biophysical variables, together with the data he collected from 93 agribusinesses. At the end of the study, the most important criteria for sustainability were determined to be economic factors, followed by environmental factors. Gündüz et al. (2011) used 20 variables belonging to social, economic and environmental factors

with the data collected from farms producing apricots, to calculate a sustainability index. The sustainability index value calculated as a result of the study was determined to be 50%. The effective factors for this value were determined to be socio-economic factors. Turhan (2005) identified the manufacturers' long-term revenue, natural resources, environment, administrative features and socio-economic impacts as the sustainability indicator. Mann and Gazzarin (2004) identified production costs and income as the economic sustainability indicator in their study. Tisdell (1996) stated that economic sustainability indicators were highly variable and this depended on the non-economic indicators.

In this study, we have sought to calculate the income level that will allow economic sustainability in agricultural enterprises. In the study, the level of income required to ensure economic sustainability was defined and explained in terms of sustainable revenues. Methodological explanations were given for the calculation of a sustainable income level. Furthermore, a survey of agricultural enterprises operating in Konya was undertaken in order to observe the operation and outcomes of management. Sustainable income was calculated using the data obtained and the results were interpreted accordingly.

2. Data collection method

The data used in this study were obtained using a face-to-face survey method. The province of Konya has a large surface area and there are 31 districts. The number of agricultural enterprises operating in Konya is 107,633 (according to the Farmer Registration System). The face-to-face survey method was used to obtain the data on enterprises. A stratified random sampling method was used to determine the number of enterprises to be surveyed (Yamane, 1967).

$$n = \Sigma\left(N_h S_h\right)^2 / (N^2 D^2 + \Sigma N_h S_h^2 \qquad D^2 = d^2/z^2$$

In the formula; n is the sample size, N is the number of enterprises in the population, N_h is the number of enterprises in the stratum h, $S^2{}_h$ is the variance of the stratum h, d is the permitted margin of error in the population mean and z represents the z-value from the standard normal distribution table according to the error rate. The formula $N_h S_h * n / \Sigma N_h S_h$ was used to determine the distribution of the defined sample size across the various strata. Accordingly, the number of enterprises surveyed from each group is given below. In determining the sample, a 99% confidence range and a 5% margin of error were used. The number of enterprises to be surveyed was determined to be 181 (Table 1).

Table 1. The number of sample enterprises.

The enterprise groups		N_h	S_h	Mean	C.V.	n
1. Group	0–5 ha	8,596	10.26	32.50	31.57	24
2. Group	5.1–15 ha	9,584	28.06	89.75	31.27	73
3. Group	15.1–25 ha	4,177	41.52	208.26	19.94	47
4. Group	25.1–99.9 ha	1,393	98.86	408.18	24.22	37
Total		23,750				181

Note: N_h is the number of enterprises in the stratum h, $S^2{}_h$ is the variance of the stratum h. C.V. is the Coefficient of Variation.
Source: Data obtained by calculation.

3. Logical framework of sustainable income

Economic sustainability, in line with the purposes of this study, was defined as 'Achievement by an agribusiness of an income that will meet the subsistence needs of the people dependent on the agribusiness, depreciation and interest against the fixed capital used in production'. Similar definitions are available in the literature. Çetin and Tipi (2005) used the concept of viable businesses as equivalent to the concept of sustainability and described viable enterprises as those providing sufficient income to enable them to take up innovations and meet the subsistence needs of the people dependent on them.

Another definition is given in 'The regulation for the detection of whether Agribusinesses have sufficient Agricultural Assets' issued by the Ministry of Food, Agriculture and Livestock and in communiqué No. 2003/20 issued on the basis of this regulation. The concept identified in this regulation and communiqué was referred to as 'sufficient income of agribusinesses'. In the aforementioned regulations and communiqué, it was indicated that

> the concept of sufficient income for an agricultural enterprise: the size of the smallest business that can supply the development needs for the enterprise by providing reasonable opportunities for production, providing an income to ensure the economic and social development of the family, ensuring the conservation of nature and the sustainability of agriculture.

On the other side, sustainability of agricultural enterprises can be achieved by means of low-cost activities that generate positive social effects and improve environmental performance without damaging economic performance (Majewski, 2013).

Within the framework of the definition given for this study, the economic sustainability measure was calculated by using the subsistence needs of the enterprise population, the depreciation of fixed capital and the interest calculations. It is necessary to implement technological innovations, as well as to address economic losses, in order to maintain the existence of an enterprise.

Amortisation, which is the depreciation of fixed capital in the enterprise, was considered as an economic loss and it is expected that this will be met from the proceeds obtained as a result of operating activities. In addition, to enable enterprises to adapt to changing conditions, it is important that they are able to adopt new innovations and to acquire new technologies. Therefore, it is important that the income from the enterprise activity is sufficient to enable them to keep up with new technologies. Depreciation expenses are included within operating expenses and, while the economic activity of each enterprise is being evaluated, these are considered among the expense items. Thus, it is assumed that these costs are utilised for the renewal of fixed capital. However, an expense item is not in question in the enterprise accounting for the purchase of new technologies. Within the scope of this work, the interest against fixed capital can also be used to acquire new technologies. Indeed, capital interest is identified within business expenses as an opportunity cost. Thus, when enterprises have sufficient revenue to cover the subsistence needs of the people dependent on them, the depreciation and interest costs against fixed capital, they can be considered as sustainable.

4. Calculation of subsistence needs

One of the components of economic sustainability within the scope of this study is for the enterprise revenues of the enterprise to meet the subsistence needs of the people dependent on it. Indeed, the existence and sustainability of enterprises is associated with the

socio- economic prosperity of the population. If the enterprise managers and their families earn a satisfactory level of income from the agribusiness they own, then this will ensure the continuity of the business. The sustainability of the enterprises that do not achieve a satisfactory income in terms of socio-economic welfare is at risk. Therefore, the requirement to meet the subsistence needs of the people dependent on the agribusiness was identified as a component of sustainability within the scope of this study.

In determining the level of physical and financial needs for annual subsistence, the method applied by the Turkey Statistics Institute in the determination of poverty and living conditions was used (Turkish Statistical Institute, 2012). Subsistence farming methods applied by the enterprise are used to determine poverty and living conditions for households. During the survey stage, respondents were asked to provide data concerning physical and monetary amounts for the vital goods and services required to support the people who were dependent on the agribusiness. Thus, the monetary value of the annual subsistence needs for the study population was defined within the scope of the study.

5. Determination of the enterprises' capital structure

Physical and monetary values for capital elements owned by the enterprises were taken from business managers during the survey stage and they were classified according to functions. The classification of the capital according to the layout of the balance sheet is as follows (Rehber & Çetin, 1998).

The capital structure of agricultural enterprises according to the balance sheet.

Assets	Liabilities and equity
(1) Farm Capital	(1) Outside Capital
(a) Farmland capital	(a) Current liabilities
(b) Land reclamation capital	(b) Bank and Cooperative liabilities
(c) Building capital	(c) Land and mortgage liabilities
(d) Plant capital	
(e) Hunting and fishing capital	
(2) Operating Capital	(2) Equity
(a) Fixed capital	
• Breeding animal capital	
• Equipment and machinery capital	
(b) Revolving capital	
• Material and ammunition capital	
• Currency capital	

Source: Data obtained by calculation.

6. Calculation of fixed capital depreciation

Fixed capital elements subjected to depreciation and involved in production by agricultural enterprises are land reclamation capital, buildings, fruit trees, tools, machines and animals. Depreciation rates determined by the Revenue Administration Presidency were used to calculate the depreciation of fixed assets (Revenue Administration, 2012).

7. The calculation of fixed capital interest

In order to calculate the fixed capital interest, the value of half of the capital value was considered. In calculating the interest costs, operating at over half of the fixed capital assets is found to be

associated with depreciation. When a linear method is used in depreciation calculations, the average investment amount for fixed capital assets during their economic life is equal to half of their cost. Therefore, the interest calculation is undertaken for half the value of the fixed capital assets subject to depreciation (Kıral, Kasnakoğlu, Tatlıdil, Fidan, & Gündoğmuş, 1999).

For equipment-machinery and building capitals;

$$\text{Interest Amount} = \frac{\text{Machine or Building Value}}{2} * \text{Interest Rate}$$

For breeding animal capital

$$\text{Interest Amount} = \frac{\text{Breeding Value} - \text{Slaughter Value}}{2} * \text{Interest Rate}$$

Since capital calculations will be conducted over the period end values of the fixed capital factors, the real interest rate was used for both equities (İnan, 2008).

8. Sustainable income methodology

The economic sustainability of agribusinesses was defined as three components. These include the income to meet the subsistence needs of the people dependent on the enterprise, depreciation and interest costs. The income acquired by the agribusinesses after the costs they have incurred as a result of economic activities conducted over the year is expected to meet the subsistence needs of the people dependent on the enterprise, the depreciation costs against fixed capital and the interest. The market prices of goods and services produced during a production period in the agribusinesses and their value give the gross daily product (G.D.P.). This concept is referred to as gross revenue/product in the general business literature (Talim, 1999, p. 143) and it consists of the following items (Gölge, 1996, p. 76):

- revenues obtained from the sale of vegetable and animal products produced by the company;
- the value of those products manufactured by the enterprise and consumed by the enterprise and farm families;
- the value given to third parties for products produced by the enterprise;
- the value of inventories for capital gain, depending on manufacturing activities;
- the income provided from agricultural activities such as agricultural labour and tool-machine services provided outside the enterprise; and
- the rent money from resident workers at the enterprise and the business managers and their families.

The net income is obtained by subtracting the gross proceeds of the production costs (Gölge, 1996, p. 82).

Production expenses include the following expenses.

- labour costs;
- materials costs;
- a decrease in inventory assets;
- the depreciation of fixed capital; and
- fixed capital interest costs.

However, the depreciation of fixed capital, the interest against fixed capital and family labour costs are not included within the sustainable production costs in the income methodology. This is because sustainable income aims to meet the depreciation of fixed capital and interest, together with the subsistence needs of the people dependent on the enterprise. Since compensation for family labour fees is the major source of income providing the subsistence income, it was not included within the production costs. On the basis of these explanations, the income providing economic sustainability was termed 'Sustainable Income' and formulated as follows.

Sustainable Income (S.G.) = Gross output − Production costs (family labour remuneration, excluding depreciation and interest against fixed capital)

Therefore, sustainable income can be accepted as economically sustainable as compensation to meet the subsistence needs of the people dependent on agribusinesses together with the depreciation and interest costs against the fixed capital.

If the sustainable Income ≥ Subsistence Expenses + Depreciation + Interest, the agribusiness is economically sustainable.

If the sustainable Revenue < Subsistence Expenses + Depreciation + Interest, the agribusiness is not economically sustainable.

9. Results and discussions

The enterprises with sustainable income are those enterprises supplying subsistence needs, fixed capital depreciation, fixed capital interest and all other production costs excluding family labour. In addition to this, having the sustainable income of the enterprises means that the enterprises have an income for investing in modernisation and buying new technologies. These enterprises are defined as group A. The enterprises surveyed were generally identified as sustainable enterprises. This situation varies according to the enterprises groups. Enterprises in the first and second groups were determined to be economically non- sustainable, due to their averages. The average land size of the businesses in the first and second groups was designated as 3.28 ha and 10.94 ha, respectively. Indeed, 83.4% of agribusinesses in Turkey have less than 10 ha in terms of land assets. The land asset used for production by these enterprises constitutes 42% of the total land assets (Turkish Statistical Institute, 2014). In this case, it is important that the hosting company is assessed in terms of population and land. The average land assets for the enterprises in the third and fourth groups were identified as 22 ha and 44 ha, respectively. This result indicates that the enterprises with land assets exceeding 15 ha in the province of Konya may have a sustainable income (Table 2). Similarly, Majewski (2013) found that the economic sustainability index was increasing as long as the farm area increased.

The enterprises that are not economically sustainable are small-scale enterprises and there is a significant influence of fixed capital investments in obtaining these results. Fixed costs of high-value mechanisation investments and modern construction are the cause of these results. In order that economic sustainability of agricultural enterprises, improving production activities and increasing profitability are important, especially in the regions having marginal agricultural land and limited alternative income sources.

According to the report of EU Commission (2014), agricultural income comprises the total value of production, subsidies minus taxes, the costs of intermediate inputs and the depreciation of farm capital. The value of production is stable, while depreciation costs

Table 2. Determination of the economic sustainability of the enterprises surveyed.

	Subsistence income		The depreciation of fixed capital		Interest on fixed capital		Sustainable income level of the enterprises	Typology of sustainable enterprises	Income level	Gross output	Production costs
Enterprise group	$	%	$	%	$	%	$		$	$	$
1. Group	8,367	68.92	2,745	22.61	1,029	8.48	12,141	B	10,547	20,375	9,828
2. Group	8,433	55.89	5,058	33.53	1,596	10.58	15,087	B	13,485	34,012	20,527
3. Group	10,200	53.22	6,728	35.10	2,239	11.68	19,167	A	22,183	64,850	42,667
4. Group	11,339	39.96	13,025	45.90	4,012	14.14	28,376	A	38,477	112,561	74,084
Average	9,477	51.30	6,814	36.89	2,182	11.81	18,473	A	20,463	56,269	35,806

Note: A = The enterprises that are economically sustainable; B = The enterprises that are economically unsustainable.
Source: Data obtained by calculation.

increased for EU-28 in 2015. On the other hand, a significant improvement is expected for factor income, due to better prices for meat, milk and crops, while production remained stable in 2016. This situation is related to the policies applied in E.U. countries. Indeed, national policies have a great impact on economic and ecological sustainability at the farm level (Hayati, Ranjbar, & Karami, 2010). Consequently, agricultural policies such as price policies and state regulations are important for the sustainability of the enterprises.

From the standpoint of determination of sustainability of agricultural enterprises, the results obtained from this study are important. The determination of sustainability level is necessary for determining economic performance in the agricultural enterprises and accordingly planning for the future. Besides, the determining economic performance in terms of the sustainability of agricultural enterprises will become a significant factor for decision-makers in order to regulate public supports and determine other policies aimed at the sector.

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